

## Mixtures and Solutions

Unlike a compound, in which the atoms combine and lose their identities, a mixture is a combination of two or more components that retain their identities. When a mixture's components are easily recognizable, it is called a heterogeneous mixture. For example, beach sand, shown in **Figure 3.14**, is a heterogeneous mixture because its components are still recognizable—shells, small pieces of broken shells, grains of minerals, and so on. In a homogeneous mixture, which is also called a **solution**, the component particles cannot be distinguished, even though they still retain their original properties.

A solution can be liquid, gaseous, or solid. Seawater is a solution consisting of water molecules and ions of many elements that exist on Earth. Molten rock is also a liquid solution; it is composed of ions representing all atoms that were present in the crystals of the rock before it melted. Air is a solution of gases, mostly nitrogen and oxygen molecules together with other atoms and molecules. Metal alloys, such as bronze and brass, are also solutions. Bronze is a homogeneous mixture of copper and tin atoms; brass is a similar mixture of copper and zinc atoms. Such solid homogeneous mixtures are called solid solutions. You will learn more about solid solutions in Chapters 4 and 5.

 **Reading Check** Describe three examples of solutions.

**Acids** Many chemical reactions that occur on Earth involve solutions called acids and bases. An **acid** is a solution containing a substance that produces hydrogen ions ( $H^+$ ) in water. Recall that a hydrogen atom consists of one proton and one electron. When a hydrogen atom loses its electron, it becomes a hydrogen ion ( $H^+$ ). The pH scale, shown in **Figure 3.15**, is based on the amount of hydrogen ions in a solution. This amount is referred to as the concentration. A value of 7 is considered neutral. A solution with a pH reading below 7 is considered to be acidic. The lower the number, the more acidic the solution.



**Figure 3.14** Not all mixtures of beach sand and shells are alike. Mixtures from the Atlantic Ocean will contain components that are different from mixtures that form in the Pacific Ocean.

### Concepts in Motion

**Interactive Figure** To see an animation of the pH scale, visit [science.com](http://science.com).

**Figure 3.15** The pH scale is not only reserved for science class. All substances have a pH value, as you can see by the common household substances shown here.

